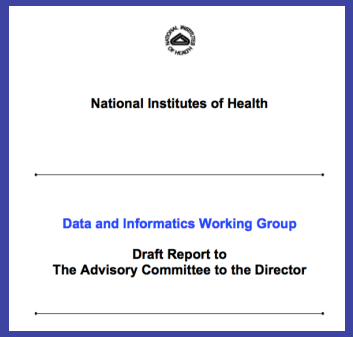
NIH As A Digital Enterprise

Philip E. Bourne Ph.D.
Associate Director for Data Science
National Institutes of Health

Data Science Timeline


National Institutes of Health

Data and Informatics Working Group

Draft Report to
The Advisory Committee to the Director

6/12

- Findings:
  - Sharing data & software through catalogs
  - Support methods and applications development
  - Need more training
  - Need campus-wide IT strategy
  - Hire CSIO
  - Continued support throughout the lifecycle

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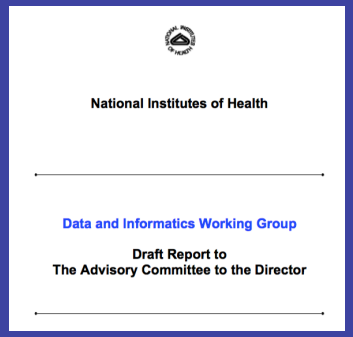
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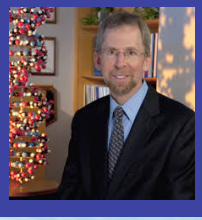

NIH Big Data to Knowledge (BD2K)

6/12 2/14

- U54 Centers of Excellence – awarded 10/14
- U54 BD2K-LINCS– awarded 10/14
- U24 Data Discovery Index– awarded 10/14
- R01, R41, R42, R43, R44, U01 software and analysis methods grants – awarded 10/14
- T32, T15, K01, R25 and R26 training awards – awarded 10/14

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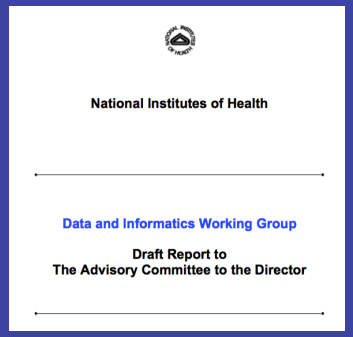
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Mission Statement

To foster an ecosystem that enables biomedical research to be conducted as a digital enterprise that *enhances health, lengthens life and reduces illness and disability*

Example Components of the Ecosystem

- NIH
  - 20/27 ICs
- Agencies
  - NSF
  - DOE
  - DARPA
  - NIST
- Government
  - OSTP
  - HHS HDI
  - ONC
  - CDC
  - FDA
- Private sector
  - Phrma
  - Google
  - Amazon
- Organizations
  - PCORI
  - RDA, ELIXIR
  - CCC
  - CATS
  - FASEB
  - Biophysical Society
  - Sloan Foundation
  - Moore Foundation

Goals & *Examples* of the Digital Enterprise

- Sustainability – *50% business model*
- Efficiency – *sharing best practices in longitudinal clinical studies*
- Collaboration - *identification of collaborators at the point of data collection not publication*
- Reproducibility – *data accessible with publication*
- Integration – *phenotype homogenization*
- Accessibility – *clinical trials registration*
- Quality – *sharing CDEs across institutes*
- Training – *keeping trainees in the ecosystem*

Raw Materials to Build the Digital Enterprise

- NIH mandate & support
- ADDS team of 8 people
- Intramural participation of over 100 team members across ICs
- Funding through BD2K:
  - ~$30M in FY14
  - ~$80M in FY15
  - ....

we have organized ourselves around 5 thematic areas …

Associate Director for Data Science

Scientific Data Council

External Advisory Board

Programmatic Theme

Sustainability	Education	Innovation	Process	Collaboration

Deliverable

Commons	Training	BD2K	Efficiency	Partnerships

Example Features

- Cloud – Data & Compute
- Search
- Security
- Reproducibility Standards
- App Store

- Coordinate
- Hands-on
- Syllabus
- MOOCs

- Community
- Centers
- Training Grants
- Catalogs
- Standards
- Analysis

- Data Resource Support
- Metrics
- Best Practices
- Evaluation
- Portfolio Analysis

- IC's
- Researchers
- Federal Agencies
- International Partners
- Computer Scientists

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The Biomedical Research Digital Enterprise

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Programmatic Theme

Innovation

Collaboration

Deliverable

Exa

The Biomedical Research Digital Enterprise

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Sustainability	Education	Innovation	Process	Collaboration

* Hires made

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Commons	Training Center	BD2K	Modified Review	Communication

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The Biomedical Research Digital Enterprise

The Commons (Vivien Bonnazi & George Komatsoulis (NCBI))

- Public/private partnership
- Work with IC's, NCBI and CIT to identify and run pilots – cloud, HPC centers
- Port DbGAP to the cloud
- ? Experiment with new funding strategies
- Evaluate

Sustainability and Sharing: The Commons

Commons == Extramural NCBI == Research Object Sandbox == Collaborative Environment

Data

The Long Tail

Core Facilities/HS Centers

Clinical /Patient

The Why:
Data Sharing Plans

The How:

NIH Awardees

Government

Software Index

Standards

The Commons

Data Discovery Index

BD2K Centers

Rest of Academia

Private Sector

Cloud, Research Objects, Business Models

The End Game:

Scientific Discovery

Knowledge

Usability

Quality

Security/ Privacy

Metrics/ Standards

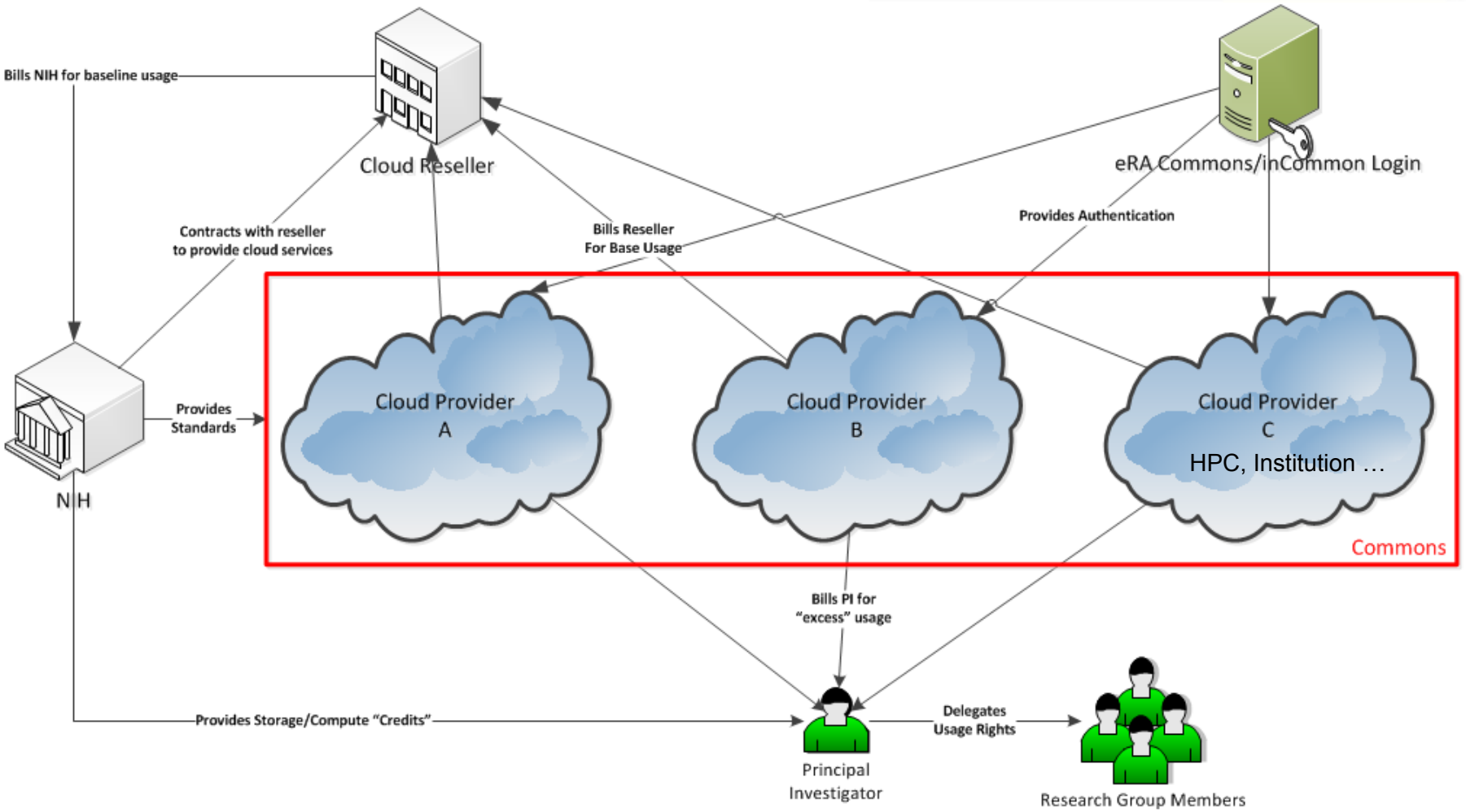
Sustainable Storage

What Does the Commons Enable?

- Dropbox like storage
- The opportunity to apply quality metrics
- Bring compute to the data
- A place to collaborate
- A place to discover

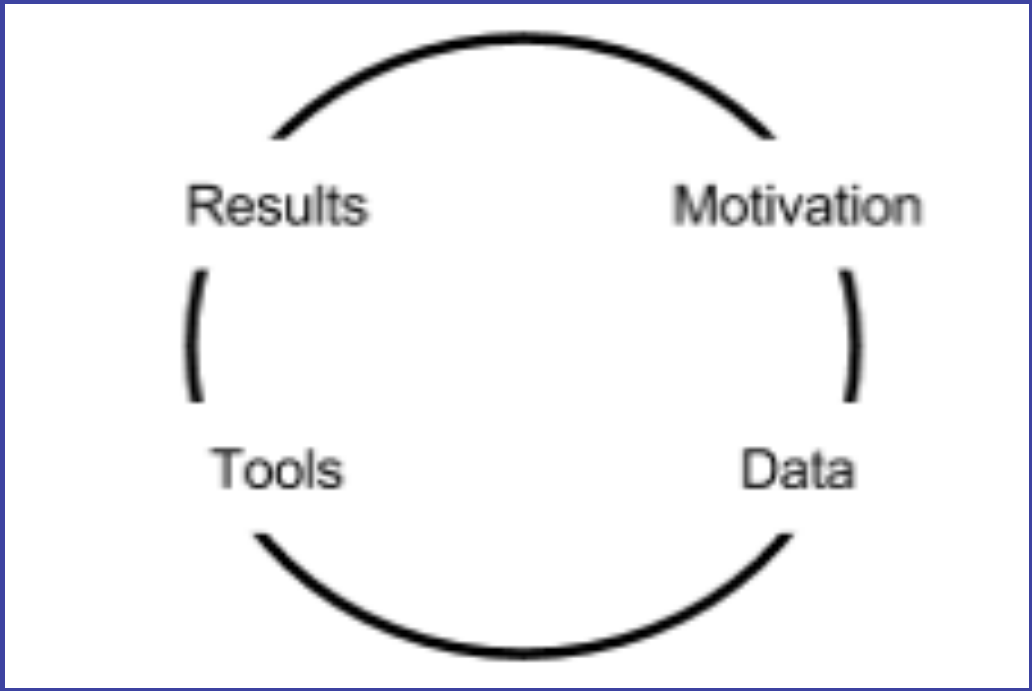
http://100plus.com/wp-content/uploads/Data-Commons-3-1024x825.png

One Possible Commons Business Model



[Adapted from George Komatsoulis]

Pilots Around A Virtuous Cycle Expect a Funding Call



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Training (Michelle Dunn)

- Training Goals:
  - Develop a sufficient cadre of researchers skilled in the science of Big Data
  - Elevate general competencies in data usage and analysis across the biomedical research workforce
  - Combat the Google bus
- How:
  - Traditional training grants
  - Work with IC's on a needs assessment
  - Standards for course descriptions with EU
  - Work with institutions on raising awareness
  - Virtual/physical training center(s)?

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BD2K Innovation FY 14 (Jennie Larkin and Mark Guyer)

- Data Discovery Index Coordination Consortium (*10/14*)
- Targeted Software Development (under review)
- 11 Investigator-initiated Centers of Excellence for Big Data (10/14)
- BD2K-LINCS-Perturbation Data Coordination and Integration Center (11-12/14)

BD2K Innovation FY 15 (Jennie Larkin and Mark Guyer)

- Governance model to foster the ecosystem
- Workshops identified, others will be considered
  - Sustainability
  - Standards
  - ELSI for research use of clinical data
  - Private sector engagement for research use of clinical data
  - Using EHRs for outcomes research
  - Gaming community contribution to biomedical research
- Software index?
- Standards framework?
- Other?

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Process Current Efforts

- Clinical data harmonization
- Data citation
- Machine readable data sharing plans
- New review models, audiences etc.
  - Open review
  - Micro funding
  - Standing data committees to explore best practices
  - Crowd sourcing

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Collaboration Current Efforts

- Joint public – private partnership workshop with NOAA?
- 2 joint workshops with NSF + Dear Colleague letter
- OSTP – Open Data 2.0
- HIRO's big data meeting
- ELIXIR working groups




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philip.bourne@nih.gov

Turning Discovery Into Health